

**SENSOR MODULE FOR CARD CONNECTOR AND CARD  
CONNECTOR HAVING SUCH SENSOR MODULE**

**FIELD OF INVENTION**

This invention is related to a sensor module for card connector and card  
5 connector having such sensor module, for further reducing an overall thickness  
of the card connector.

**BACKGROUND OF INVENTION**

Connectors capable of receiving a smart card are currently available in the  
market. A major plane of a conventional smart card is generally provided with  
10 an IC chip for storing information. After inserting the smart card into a  
compatible connector, the IC chip is electrically connected to a connecting  
means that can access information stored in the IC chip. Known designs for  
such a connecting means are disclosed in US Patent Nos. 4,900,273 and  
6,159,051. The "major plane" referred to in this invention is directed to a plane  
15 constructed by a length direction and width direction of an object.

To ensure that the connecting means is activated to access the information  
stored in the IC chip only after the IC chip of the smart card has reached the  
designated position, a card sensor is integrally provided to the connecting  
means according to US Patent Nos. 4,900,273 and 6,159,051.

20 The integral design of the card sensor with the connecting means in the  
known designs results in a higher cost. As exemplified by US Patent No.  
6,159,051, the card sensor is co-molded to the connecting means such that its  
manufacturing cost is relatively high. Furthermore, an alternative connecting  
means must be manufactured for applications that do not require a card sensor,  
25 such that the interchangeability of the connecting means in an assembly line is  
relatively limited.

Furthermore, to meet the consumers' demands for further reducing the weight and size of computer products, the thickness of a portable computer is a major concern for the consumers in selecting a portable computer. To further reduce the thickness of the portable computer, the computer manufacturers have  
5 been striving to reduce the sizes of various components, even by a difference of 2 to 3 mm, in order to reduce the overall thickness of the portable computer products.

### SUMMARY OF INVENTION

In view of the integral design of the card sensor with the connecting means  
10 found in the known designs, it is a primary objective of this invention to provide a sensor module that is a single unit module independent from the connecting means. The term "module" referred to in this invention is directed to a single component independent from the connecting means.

It is another objective of this invention to provide a single unit module that  
15 is activated by a leading edge of a card to be inserted but not by a major plane of the card. In other words, the activating direction is on the same plane of the card so as to further reduce its overall thickness, such that after the sensor module is assembled to a card connector, a low profile card connector may be obtained. The "leading edge" referred to in this invention is directed to an end  
20 edge of the card that is first inserted into the card connector.

To achieve the above objectives, this invention discloses a sensor module for a card connector, the connector having an inlet end through which the card is inserted, and a terminating end opposing the inlet end, characterized in that: the sensor module is provided at the terminating end and activated by a leading  
25 edge of the card from a normally non-actuated position to an actuated position.

According to one embodiment of this invention, the sensor module comprises: a first contact and a second contact, each having a first section and a

second section, and the non-actuate position such that the second sections are substantially parallel to one another in a normally non-contact arrangement.

The structures and characteristics of this invention can be realized by referring to the appended drawings and explanations of the preferred  
5 embodiments.

#### **BRIEF DESCRIPTION OF DRAWINGS**

Fig. 1 is a perspective view of a sensor module according to this invention.

Fig. 2 is a plan view of a sensor module according to this invention.

Fig. 3A is a perspective view of a first contact of the sensor module prior  
10 to overmolding.

Fig. 3B is a perspective view of a second contact of the sensor module prior to overmolding.

Fig. 4 is a perspective view illustrating the contacts in Figs. 3A and 3B being arranged in a substantially juxtaposed arrangement.

Fig. 5 is a perspective view illustrating an alternative embodiment of this  
15 invention.

Fig. 6 is a perspective view illustrating the sensor module in Fig. 1 being assembled to a card connector.

#### **DETAILED DESCRIPTIONS OF EMBODIMENTS**

Fig. 1 is a perspective view of a sensor module 100 according to this  
20 invention. Fig. 2 is a plan view of the sensor module 100. Fig. 6 is a perspective view illustrating the sensor module 100 being assembled to a card connector 50.

With reference to Fig. 6, the card connector 50 includes an inlet end 52

through which a card, such as a smart card (not shown), may be inserted, and a terminating end 54 opposing the inlet end 52,

With reference to Figs. 1 and 2, the sensor module 100 is provided at the terminating end 54 and arranged in such a manner that the sensor module 100 is  
5 activated by a leading edge of the card from a normally non-actuated position to an actuated position.

As shown in Fig. 2, to allow the sensor module 100 to be activated by the leading edge of the card, the sensor module includes: a first contact 110 and a second contact 120.

10 Fig. 3A is a perspective view of the first contact 110 of the sensor module prior to being overmolded into the sensor module 100; Fig. 3B is a perspective view of the second contact 120 of the sensor module prior to being overmolded into the sensor module 100.

As shown in Figs. 3A and 3B, the first contact 110 has a first section 112  
15 and a second section 114, and the second contact 120 also has a first section 122 and a second section 124. A major plane P1 of each of the first sections 112, 122 of the first and second contacts 110, 120 extends in a first direction D1 that is parallel to a direction along which the card is inserted. A major plane P2 of each of the second sections 114, 124 of the first and second contacts 110,  
20 122 extends in a second direction D2 along which the leading edge of the card extends and that is normal to the first direction D1.

Preferably, the first contact 110 and second contact 120 are stamped from rolled metal sheet of conductive material having suitable spring properties or made by any other appropriate manufacturing processes.

25 Fig. 4 is perspective view illustrating a state where the first contact 110 and the second contact 120 shown in Figs. 3A and 3B are arranged in parallel. At this time, transitions of the first sections 112, 122 and the second sections

114, 124 of the first and second contacts 110, 120 are overmolded by a first overmolding body 130 to maintain the second sections 114, 124 of the first and second contacts 110, 120 at a substantially parallel and normally non-contact arrangement, that is, the non-actuated (or normally open) position shown in Fig.

5 1.

Fig. 5 illustrates an alternative embodiment, wherein the first contact 110 and a second contact 120 illustrated in Figs. 3A and 3B, respectively, are arranged in a substantially parallel arrangement with the second sections 114, 124 of the first and second contacts 110, 120 converging towards one another. At this time, transitions of the first sections 112, 122 and the second sections 114, 124 of the first and second contacts 110, 120 are overmolded by a first overmolding body 130 to maintain the second sections 114, 124 of the first and second contacts 110, 120 at a normally contact arrangement, that is, an alternative non-actuated (or normally closed) position shown for the alternative embodiment.

As shown in Figs. 1 and 2, the second section 112 of the first contact 110 preferably includes an extension section 116, that first comes into contact with the leading edge of the card to be inserted. When using the sensor module 100 shown in Figs. 1 and 4, the second section 114 of the first contact 110 is driven by the leading edge of the card to contact the second section 124 of the second contact 120 when the extension section 116 comes into contact with the leading edge of the card so as to assume the actuated position, such that an electrical signal is generated to ensure that the card has reached a designated position in the card connector 50.

When using the sensor module 100 shown in Fig. 5, the second section 114 of the first contact 110 is driven by the leading edge of the card to separate from the second section 124 of the second contact 120 when the extension section 116 comes into contact with the leading edge of the card so as to

assume the open position, such that an electrical signal is generated to ensure that the card has reached a designated position in the card connector 50.

With reference to Fig. 6, to allow easy assembly of the two sensor modules 110 shown in Figs. 4 and 5 into the card connector 50 shown in Fig. 6, an indent 58 is formed at an appropriate location of a housing 56 of the card connector 50, the indent 58 having a configuration compliant to a configuration of the first overmolding body 130 for assembling and securing the sensor module 100 to the housing 56.

The sensor module 100 may further include a second overmolding body 149 overmolding the first and second contacts 110, 120 at locations distant from the first overmolding body 130. In addition, the second overmolding body 130 may further include a locking mechanism 142, such as an aperture, adapting to a compliant part provided on a connecting means 59 of the card connector 50 so as to lock the sensor module 100 to the connecting means 59.

The sensor module 100 according to this invention may also be implemented in a conventional, stacked card media connector, so long as the housing 56 is further defined with a second storage area for receiving a second card-like media, wherein the second storage area is stacked above a first storage area defined by the housing 56.

As shown in Fig. 6, because the single unit sensor module 100 is activated by a leading edge of a card to be inserted but not by a major plane of the card, the activating direction is on the same plane of the card so as to eliminate the space required for activation by the card along a direction normal to the major plane, such that the overall thickness of the card connector 50 may be reduced while obtaining a low profile card connector at the same time.

In addition, the single unit module independent from the connecting means need not be co-molded to the connecting means, such that elimination of the

process for assembling the card sensor to the card connector will provide a card connector used for applications that do not require a card sensor, to improve the interchangeability of the connecting means in an assembly line.

This invention is related to a novel creation that makes a breakthrough in the art. Aforementioned explanations, however, are directed to the description of preferred embodiments according to this invention. Various changes and implementations can be made by persons skilled in the art without departing from the technical concept of this invention. Since this invention is not limited to the specific details described in connection with the preferred embodiments, changes to certain features of the preferred embodiments without altering the overall basic function of the invention are contemplated within the scope of the appended claims.

#### LISTING OF NOMENCLATURES

	50	card connector	110	first contact
15	52	inlet end	112	first section of first contact
	54	termination end	114	second section of first contact
	56	housing	116	extension of first contact
	58	indent	120	second contact
	59	connecting means	122	first section of second contact
20	100	sensor module	124	second section of second contact